



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: Trent7000-70
UNIQUE ID NUMBER: 02F23RR140
COMBUSTOR: Phase5 Tiled
ENGINE TYPE: TF

BYPASS RATIO (-): 9.1
PRESSURE RATIO π_{co} (-): 44.1
RATED OUTPUT F_{oo} (kN): 317.8

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{oo} (mg/kN)	LTO_{num}/F_{oo} (particles/kN)	NVPM MASS CONCENTRATION ($\mu\text{g}/\text{m}^3$)
LTO/F_{oo} AND MAX $nvPM_{mass}$	208.4	1.75E+15	3410
AS % OF CAEP/10 LIMIT	-	-	86.0
AS % OF CAEP/11 LIMIT (InP)	60.0	42.1	
AS % OF CAEP/11 LIMIT (NT)	97.4	63.1	

MEASURED DATA

MODE	POWER SETTING (% F_{oo})	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK $nvPM_{mass}$ ($\mu\text{g}/\text{m}^3$)
				EI_{mass} (mg/kg)	EI_{num} (particles/kg)	
TAKE-OFF	100	0.7	2.373	54.7	1.72E+14	
CLIMB OUT	85	2.2	1.943	94.1	3.24E+14	
APPROACH	30	4.0	0.645	70.2	8.41E+14	
IDLE	7	26.0	0.250	18.5	4.38E+14	
LTO TOTAL (kg, mg, number of particles)			900	47639	4.01E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/F_{oo} VALUES (mg/kN, particles/kN)				149.9	1.26E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				151.8	9.59E+14	2649

* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% F_{oo})	CORRECTED EMISSIONS INDICES	
		EI_{mass_SL} (mg/kg)	EI_{num_SL} (particles/kg)
TAKE-OFF	100	58.7	2.35E+14
CLIMB OUT	85	102.0	4.84E+14
APPROACH	30	81.3	1.89E+15
IDLE	7	22.4	8.80E+14

AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	100.8	101.6	HEAT OF COMBUSTION (MJ/kg)	43.34
TEMPERATURE (K)	287.0	292.6	HYDROGEN CONTENT (%mass)	13.97
HUMIDITY (kg water/kg dry air)	0.0080	0.0090	AROMATICS CONTENT (%vol)	15.9
			NAPHTHALENE CONTENT (%vol)	0.11
			SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER: Rolls-Royce plc
TEST ORGANIZATION: Rolls-Royce plc
TEST LOCATION: Derby
TEST DATES: 04/10/2018

REMARKS

1. Certification Report EDNS01000740804
2. Correction of minor error in reported nvPM data
3. The maximum EI_{mass} occurs between 30% and 85% F_{oo}
4. The maximum EI_{num} occurs between 30% and 85% F_{oo}